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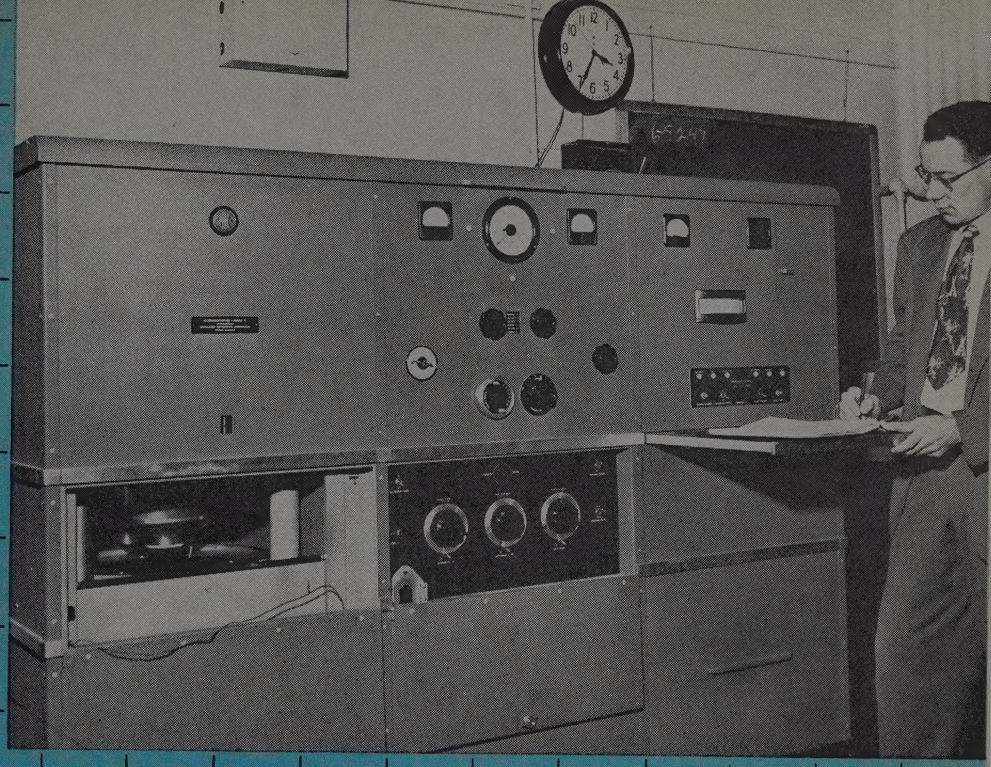

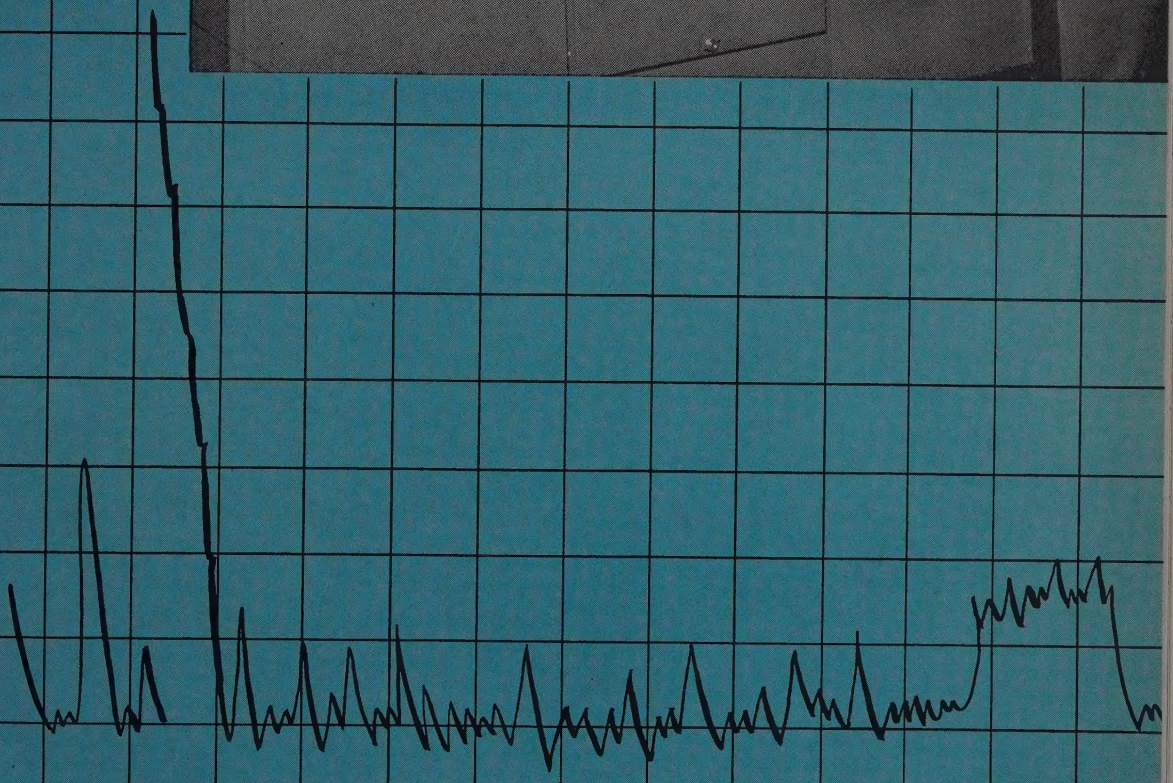

the **illinois technograph**

mber
m. a.

november, 1950

What Happens When 150,000,000 People Say:

"I WANT!"

THE STORY OF OIL

COLONEL Edwin Drake's oil well, drilled in 1859, produced only 20 barrels daily . . .

But it gave people a taste of the benefits of petroleum—and a great industry was off to a flying start!

The first drilling rigs—first refining equipment—were adequate for that early demand.

But invention of the automobile, airplane, Diesel engine and other great machines in turn demanded great invention in oil—and old-fashioned equipment gave way to scientific research laboratories, modern refineries, pipelines, tankers and tank cars.

Each year demand made them bigger and better!

Today, thousands of oil companies with oil fields, refineries, bulk plants, service stations and cost-cutting transportation systems—deliver over 1,840,000,000 barrels of petroleum yearly—meet U.S.A.'s demands for *value in oil.*

And, today, the responsibilities of Socony-Vacuum, one of the oldest companies in the industry, are constantly mounting . . .

Unprecedented demand for petroleum products calls for expansion in every phase of our efficient, coordinated operation . . .

46,400 independent "small" businessmen must be kept *competitive*—supplied with what it takes to provide a *big money's worth* for you—a good living for themselves.

When 150,000,000 Americans say, *"I want,"* it takes businesses of all sizes to deliver!

DEMAND DETERMINES BIGNESS

The Flying Red Horse Companies

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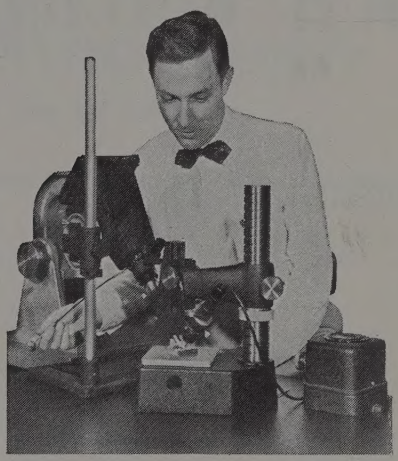
SOCONY-VACUUM

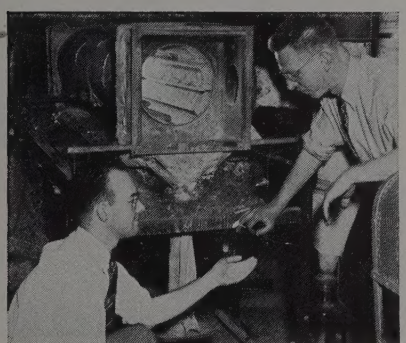
THE DU PONT DIGEST

Engineers At Work

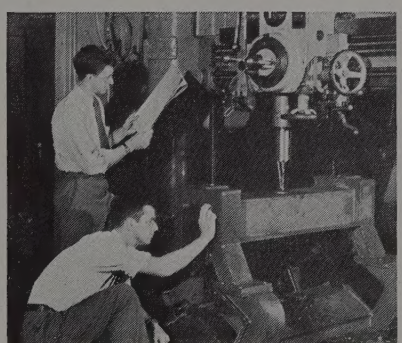
AT DU PONT THEY FIGURE IMPORTANTLY IN MANY FIELDS

R. E. Sugg, *B.S. in M.E., George Washington University, 1948, doing mechanical research to improve machine design. His optical-slit microscope measures surface scratches as fine as 20 millionths of an inch.*

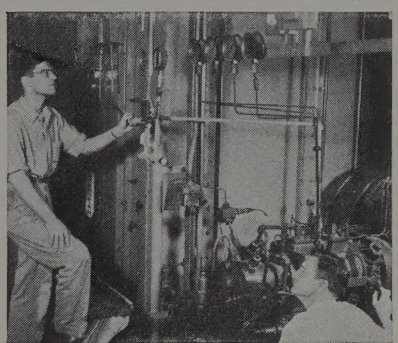




Studying product development *in a rotary dryer are: H. J. Kamack, B.S. in Ch.E., Georgia Institute of Technology, 1941; and F. A. Gluckert, B.S. in Ch.E., Penn State, 1940.*



Checking component *for machine used to finish rolls to high degree of precision: Donald F. Miller, B.S. in M.E., Lehigh, 1950; and Albert W.G. Ervine, M.S. in M.E., Michigan, 1950.*



R. L. Stearns, *B.S. in Ch.E., Yale, 1949; and H. Peterson, B.S. in Ch.E., Northeastern University, 1942, checking a multi-stage carbon-monoxide compressor used for making methanol.*

BECAUSE Du Pont is a chemical company, you might expect most of its technical men to be chemists.

Actually, there are more engineers than chemists at Du Pont. In each of the ten manufacturing departments there is important work for men trained in chemical, mechanical, electrical, metallurgical and other branches of engineering.

These departments operate much as independent units with their own research, development, production and sales staffs. In their respective fields, they do fundamental and applied research on both processes and products. Sometimes engineers participate in the early stages of a project. More often, however, they enter the picture when the project has moved to the point where commercial production is considered. They see it through the pilot plant and semi-works stages and assemble data necessary for the full-scale plant.

Even after manufacturing has begun, development work is continued to standardize and improve the process. Normally, engineers whose main interest is production and plant operation take over when the works stage is reached.

Engineers on the technical sales staffs help maintain contact between Du Pont and its customers. They present data on new products and guide customers in process development and similar problems. They also use their technical knowledge in making surveys of possible markets for the Company's products.

In addition to the manufacturing groups, the Du Pont Engineering Department—a central staff organization—requires engineers with many types of training. This Department carries on its own program of fundamental and applied research. It also makes site investigations, lays out and designs new plants and laboratories for the manufacturing departments. It serves them in research on process development, on materials of construction and on methods of measurement and control.

Yes, engineers figure importantly at Du Pont. Through their teamwork with chemists, physicists and other trained personnel, the Du Pont Company produces its "Better Things for Better Living...through Chemistry."

DU PONT

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BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Entertaining, Informative—Listen to "Cavalcade of America," Tuesday Nights, NBC Coast to Coast

new developments

edited by Joe Enrietto, Min.E. '52

turbosupercharger

A turbosupercharger which will enable piston-powered commercial airliners to fly non-stop from Chicago to London with heavy payloads has been developed by GE.

Engineers described the comparatively small but powerful turbo—designated the CH9—as a "significant advance in our long history of turbosupercharger development."

Turbosuperchargers, widely used by America's fighting planes in World War II, are the devices which enable airplane piston engines to "breathe" in the rarefied air of high altitudes. Spun by the engine's exhaust, they compress the rarefied air to sea level pressures before it enters the cylinders.

The new turbosupercharger entirely eliminates the conventional geared supercharger, or the impeller, operating off the engine shaft. There are no mechanical connections between engine and turbo. Development of a direct cylinder fuel injection system for the R-4360 eliminated the major need for a geared supercharger which is used to insure uniform fuel distribution to the cylinders. Engineers said elimination of the geared supercharger not only saves up to 500 hp, previously drawn from the piston engine, but also makes possible a more efficient method of cooling the combustion air going to the cylinders.

Airliners equipped with such powerplants could fly non-stop from Chicago to London, a distance of 4000 miles, carrying nearly half as many passengers as are now loaded for Chicago to New York flights. Commerical transports are unable to make such flights at present, nor can they fly non-stop from New York to London with profitable payloads. The new powerplants non-stop trans-Atlantic flights can be made at faster speeds and with heavier payloads than is now possible by airliners making two stops enroute.

"skylike" illumination

Silvray "Skylike," a new concept of electric lighting with all of the advantage of incandescent plus the modern appearance of fluorescent, has been announced.

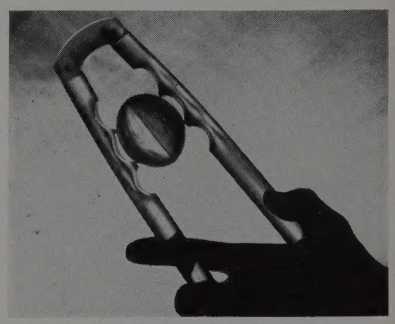
An adaptation of silvered-bowl incandescent lighting, Skylike is designed for commercial use, and the Silvray company pointed out that in addition to its appeal because of its dramatically different and better illumination, it has the advantages of simple wiring, light weight, fast installation, freedom from service call-backs, and lower cost.

Skylike's high light output includes the utmost utilization of reflected light and an even distribution of comfortable full-spectrum light. There are no sharp shadows, the 90-degree shielding prevents both direct and reflected glare, and there is a complete absence of flickering, blinking, and hum. The output can be varied from 2,500 to nearly 10,000 lumens per unit by use of 150-, 200- or 300-watt lamps; the silvered reflector is permanently sealed, and there is no light loss from depreciated ceilings, because Skylight carries its own 87 per cent reflection factor ceiling.

stressed plastic

A new plastic that can be made into scale models of machine parts and tools, now is providing "internal vision" for engineers in military, university, and industrial laboratories here and abroad, and is a new Westinghouse product.

One of the major applications of the new material is in the design of breech



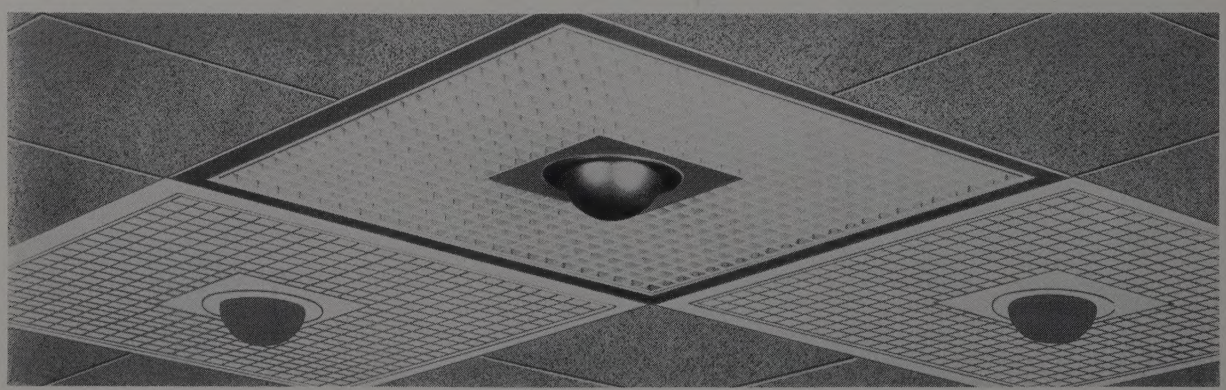
A plastic model shows the stresses to which a nutcracker is subjected. (Courtesy, Westinghouse).

blocks for big guns. To understand the terrific stresses these parts undergo during firing of the gun, an exact three-dimensional model of the block has been built and "loaded" to simulate the stress.

When frozen into the material and then viewed through special polarized light, the stress pattern appears as a series of vari-colored lines that tell the scientist where the major stresses are located, in which direction they are acting, and just how great they are.

Even medical scientists may find the new material of great value because ex-

(*continued on page* 30)



One of the latest developments of the illumination field is the "Skylike," an incandescent system which throws light into a plastic grid for diffusion. (Courtesy Silvray)

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the illinois technograph

volume 66 **number 2**

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our cover

John Scholz of the University of Illinois Chemistry Department checks the rotor temperature of the ultra-centrifuge. This instrument, one of the few of its kind in the world, is often used for finding molecular weights of heavy compounds and for separating substances, such as viruses, from mixtures. It has a maximum rotation of 60,000 RPM, and at this speed applies an acceleration of 260,000 G's. (Photo by Howie Wedelstaedt).

our frontispiece

The U. S. Coast and Geodetic Survey uses these Bilby steel triangulation towers to elevate the surveyor and his instrument above the station mark so that the lines of sight may clear all obstructions. Heights up to 129 feet may be achieved depending on the number of sections used in the tower. (Courtesy of U. S. Coast and Geodetic Survey).

the story of large-scale surveying, done by . . .

geodetic control

by Warren H. Brandt, C.E. '53

Contrasted with plane surveying, "geodetic" surveying is that branch where the shape of the earth is taken into account in the mathematical adjustment of the field-measured distances and angles.

The primary purposes of geodetic surveying operations are the establishment of fixed monuments or stations, as they are called, on the ground at some distance from one another; whose geographic coordinates—latitude and longitude and elevations—have been determined precisely. This data provides accurate control for topographic maps and for plane surveying operations which will be mentioned later.

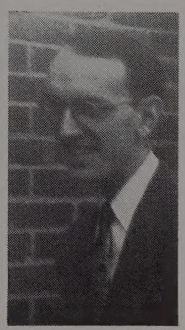
Triangulation

By way of explanation, to determine trigonometrically the length of one side of a triangle, it is necessary to know only two angles and the length of one side. In a triangulation the length of the known side must be measured very accurately. This side is designated the base-line. From it the lengths of all other sides in the triangulation system are computed. The picture shows a field party of the United States Coast and Geodetic Survey measuring the length of a base-line in Massachusetts. The tape they used is made of an alloy called invar, having a low coefficient of expansion.

Instruments for reading angles called theodolites, similar to a surveyor's transit but capable of work of greater precision, are set over the station monuments at the termini of the base line. The angles between interviewing stations are read and entered in the computation. Often structures, trees and obstructions prevent the observation from the ground so that the instrument and observer must be elevated over the station mark. This is done with the use of towers. It should be emphasized that in a tower of the type pictured there is no integral connection between the inner tower on which the instrument is placed and the outer tower which supports the observer. This tower, called the Bilby triangulation tower, and the theodolite were designed by members of the Coast and Geodetic Survey staff.

The first primary triangulation (primary triangulation later officially designated first-order triangulation is work of highest precision, work of the next lower precision is designated the second-order, etc.) in the Chicago area was made in 1874 under the direction of the United States Lake Survey, a branch of the Army Engineer Corps, to provide a much needed control for their charts of the Great Lakes.

The author, Warren H. Brandt, graduated from Lane Technical School in June, 1942, and worked in various capacities with surveying parties of the Chicago and North Western Railway during the years 1943-47. He was employed as an instrument inspector with a prominent Chicago consulting engineer firm before coming to Illinois in February, 1950. He has attended Northwestern University and Illinois Institute of Technology and is a member of the American Society of Civil Engineers and the Western Society of Engineers.



WARREN H. BRANDT

The triangulation net which eventually encompassed Chicago and was extended to Lake Erie was commenced in 1861 by the accurate measurement of a base-line 19,871 feet in length on Minnesota Point, a sand spit in the harbor of Superior, Wisconsin.

The original measurement of the Minnesota Point base was made under the supervision of Captain, later General, George C. Meade, the famed Civil War hero noted for his victory at Gettysburg. This base was remeasured in 1870 and from it measurements and angles were carried through the triangles to Chicago, the parties reaching the station at Deerfield in August of 1873.

From the station at Deerfield, lines of triangulation were carried around the southern end of Lake Michigan in 1874.

Because of the lack of funds no further work was carried on in this area until 1877.

In May of 1877 a site was selected between what is now 71st Street and Pulaski Road in Chicago and 59th Street and Archer Avenue in Summit for the measurement of a base-line.

This base measuring apparatus made

(*continued on page* 20)

Members of the U. S. Coast and Geodetic Survey take measurements on a base line with an invar tape. (Courtesy of the U. S. Coast and Geodetic Survey).

tapping the thought waves of the human brain by . . .

electroenc

The following article was a prize-winning paper in the undergraduate division of the Technical Papers Competition at last year's AIEE midwestern convention.

Electroencephalography is the study of brain waves, the cyclically varying potentials existing in the brain. The existence of these phenomena was not a recent discovery; but large strides have been made recently in investigation and application of results because of the advances in electronic techniques made in the last few years.

This article gives a brief summary of the physiological phenomena and describes the equipment and techniques used in this science.

The science of electroencephalography (EEG) is usually considered to have had its beginning in the 18th century with the discovery of so-called "animal" electricity by Galvani. Since that time electrical activity of living tissue has been the subject of much experimental work. Electrodes have been applied to laboratory animals and to all parts of the human body in the attempt to locate new sources of these potentials.

One of the most easily detected potentials was found to originate in the muscles of the heart. Because of their relatively high amplitude and correlation with the heart beat, these muscle voltages, known as the electrocardiogram when recorded, were the first to be studied and applied to medical science. Electrocardiography is now a standard technique in the diagnosis of heart disease.

It is easily understood why the extremely minute brain potentials were unnoticed for so long in view of the crude instruments available and the other higher amplitude voltages present. Although several others had made many basic observations, Hans Berger, a German psychiatrist, is credited with the first important contributions in this field and was truly the "father" of EEG. He spent more than ten years studying electrical potentials which he obtained by placing electrodes upon the scalp of human subjects. After these years of careful study, he published a paper in 1929 announcing his conclusions that the potentials had their origin in the brain. Subsequent reports were published only to be ignored or dismissed as representing nothing but "stray pickup" noise voltages or muscle artifacts. The first serious recognition Gerger received was from Adrian, distinguished Nobel Laureate in physiology. Since that time, the field of EEG has developed rapidly, vastly improved instruments have been devised, new techniques developed, and many brain potential waveforms correlated with specific brain functions or disorders.

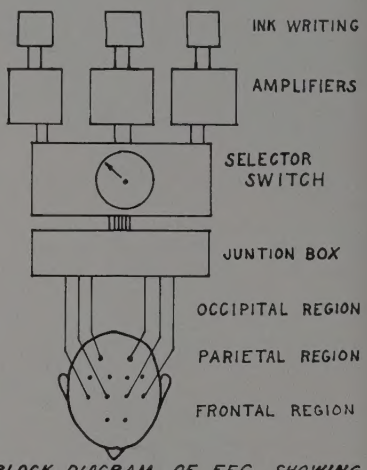
Nerve and Brain Cell Activity

All living cells exhibit four basic forms of activity. They are, to a varying degree, mechanical, thermal, chemical, and electrical, and none can be considered independently of the others. A single component of activity gives only an incomplete picture; but, because of the limits of human comprehension and the inadequacy of instrumentation, it may be the only noticeable manifestation of the intricate processes going on within the cell.

Since living tissue is a complex matrix composed of individual cells, each filled with an electrolytic fluid, it is a good electrical conductor. Therefore, it is possible to study electrical activity through masses of surrounding tissue. This consideration, together with the very great sensitivity of electrical techniques, has caused the electrical activity to receive the greatest attention.

The origin of the potentials is apparently in the neurons of the cortex or outer covering of the brain. Different areas and lobes of the brain exhibit characteristic differences, but there is no sharp delineation of this activity.

The periodic nature of the brain potentials is their most distinguishing characteristic. The frequencies encountered range from one cycle per second to 60 cycles per second or higher. The most striking aspect is the relation between stimulus or physiological activity, and the magnitude and frequency of the waves. In general it may be said that the frequency is proportional and the magnitude inversely proportional to the physiological activity. For example, the cortical potentials of a rabbit increase in frequency and decrease in magnitude when the eye is strongly illuminated. This might be compared to radio transmission of intelligence by frequency modulation and amplitude modulation. Perhaps it is the body's method of eliminating interference from spurious currents of fields.



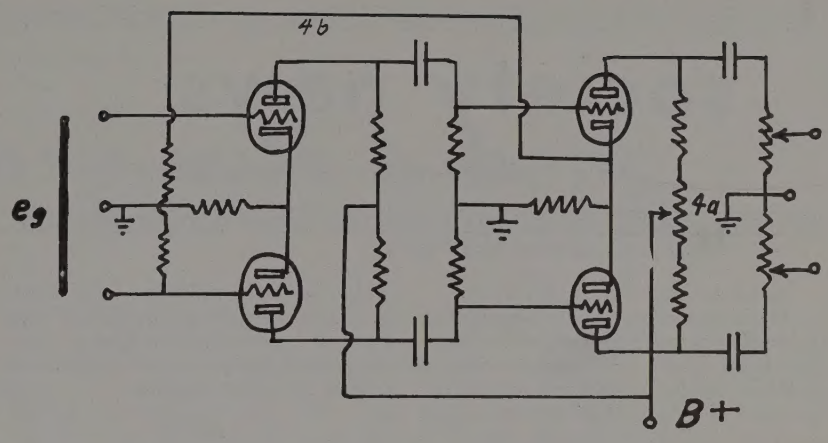
BLOCK DIAGRAM OF EEG, SHOWING ELECTRODE PLACEMENT, CORTICIAL AREAS AND REPRESENTATIVE "BIPOLOR" CONNECTION.

EEG apparatus is connected to six vital locations on the human head.

The average peak-to-peak voltage obtained on the scalp of an individual is about 50 micro-volts. However, in epileptic seizures, these peaks may exceed 300 micro-volts and are associated with violent physiological reactions.

Method of Pickup

Many different methods of pick-up have been used including electrodes placed directly on brain tissue, needles piercing the scalp, chemically soaked cloth pads, and small lead buttons containing saline electrode jelly and held on with collodian. Of these, the latter



BASIC PUSH-PULL PREAMPLIFIER

The resistance-capacitance coupled voltage amplifier has proved to be the best equipment for the amplification of brain wave potentials. Push-pull stages throughout increase stability and minimize stray noise and hum pickup.

ohalography

. . . by John F. Wood, E.E. '50

is the most satisfactory and is widely used. Obviously brain tissue is not directly accessible except during a major operation, as for a brain tumor, for example.

There are six standard locations for electrodes ordinarily used. These are shown in one of the accompanying diagrams. However, when greater localization of certain areas is desired, other arrangements are used.

Of course any potentials must be measured with reference to some point. In the monopolar connection, one lead to the amplifier is attached to an inactive or neutral area such as the lobe of the ear. This is considered inactive as it is relatively distant from the brain. However, large muscle potentials can exist here when, for example, the jaws are clenched tightly. The other lead to th amplifier channel is attached to some area on the scalp directly over the area being studied.

A second arrangement of input leads is called the bipolar connection. In this case, both leads are attached to active areas. The resulting waveform is essentially the algebraic sum of the potentials present under each electrode.

Monopolar leads are used most commonly as the recordings are easier to interpret. However, bipolar leads permit accurate localization of certain disorders including tumors, abscesses, and fractures. All equipment is readily operated with either monopolar or bipolar leads.

Instrumentation

The earliest work on the detection and measurement of brain waves by Hans Berger was done with a sensitive string galvanometer designed by Einthoven for registering the electrocardiogram. However, the brain potentials have an amplitude of approximately 30 micro-volts, or 1-100 of that obtained from the heart. The impedence or resistance of the scalp between electrodes is about 10,000 ohms. The low impedance of the galvanometer seriously loads such a high impedance circuit, thus further aggravating the sensitivity problem. Furthermore, this resistance of the scalp shunted across the galvanometer terminals may damp the movement to such a degree that it will not respond to the frequencies being studied.

Obviously, the many limitations of the galvanometer as a recorder led to the development of an electronic amplifying system. Here there was no problem of impedance matching; vacuum tubes are inherently high impedance devices. They are capable of responding to all frequencies present in the EEG without any of the damping effect encountered in the galvanometer; and, with several stages, the desired sensitivity can be attained.

However, the practical design of such an amplifier posed many problems at that time. Because of the extremely small magnitude of the voltages, an amplification of approximately 10 million or 140 decibels is necessary. Components then available such as tubes and resistors often produced noise voltages over 100 microvolts. The desired signal was thus completely masked by noise. Amplifier circuits were very unstable and had to be continually adjusted while in operation. Since a reflecting galvanometer was still used, it was necessary to use photographic recording in order to obtain a continuous record. This is a more serious disadvantage than might be supposed. Aside from higher cost, the record is not seen until hours after it has been taken, and it is therefore difficult to make correlations between the behavior of the patient and the electrical activity of the brain.

Because of these difficulties, the electrocephalograph remained in the laboratory and had little clinical use.

In 1934, Gorceau provided the first clinical EEG which was both serviceable and cheap. It was sensitive to all frequencies up to 70 cycles per second with a sharp drop in response above that point.

Amplifier Design

The resistance-capacity coupled, push-pull amplifier has been by far the most practical EEG amplifier and is now used in all commercial instruments. The direct coupled amplifier has been used for EEG but is not ordinarily desirable because of the usual instability, drift, difficulty of adjustment and complexity

(*continued on page* 24)

society news

by Clarence Niebow, M.E. '51

ENGINEERING COUNCIL

The first meeting of the Engineering Council was held on September 28 at the Illini Union. At this meeting, a publicity committee was formed for the purpose of stimulating interest in all activities dealing with engineering. This semester the council will try to get an office for all the engineering societies.

The officers for this coming school year are Errol Rodda, president; Al Makulec, vice president; Robert Johnson, secretary; and Bud Brux, corresponding secretary.

Committee appointments for the fall semester are Bob Johnson and Bob Cox, co-chairmen of the St. Pat's Ball; Wolfgang Junkel and Roger Baker, convocation; Ray Brown, Corliss Laisure, and Ernest Ulm, constitution; Bob Cox and Ed Christiansen, physical improvements; Ervin Schuetze, instructor evaluation; Ray Brown, society calendar; Connie Minnich, Wayne Hartman, Gerald Slusser, Ernest Moore, publicity; Al Makulec, tours; and Elmer Honath and Bill Anderson, program.

AIEE-IRE

The first official meeting of the American Institute of Electrical Engineers-Institute of Radio Engineers served as a general introduction of the society and its activities to new members. The branch counselors, Prof. E. A. Reid and Prof. E. C. Jordan, were introduced by the chairman, C. Gene Blanyer, and a brief summary of the activity agenda for the coming year was presented.

Dr. John D. Ryder, head of the electrical engineering department, was introduced as the speaker of the evening. He presented a very interesting and timely discussion on the new EE curriculum, emphasizing the fact that a marked distinction no longer will be made between the different options, but that the department will strive for greater homogenity.

After the meeting, cider and doughnuts were served in the Dynamo Lab where the meeting was held. Thirty new members were signed up, making a total of approximately 300 students now in the student branch of the AIEE-IRE.

At the next meeting, Mr. Walter Wallin, sales engineer for Alfred Crossley and Associates, sales agency of several brands of electronic test equipment, will be the guest speaker.

ASCE

The first meeting of the ASCE was held on October 5 at Latzer Hall. The film that was shown, "Rail Steel in the World Today," was the complete story of the manufacture of new rails and the reclamation of used rails to produce high strength steel sections.

The officers elected by ballot last spring are Ronald Hoefle, president; Frank Blake, vice president; Dean Felton, secretary; and Arnold Sauers, treasurer.

CHI EPSILON

At the recent meeting of Chi Epsilon, Professor Edward E. Bauer spoke on "The Opportunities for a Young Engineer in Plain Concrete."

The main project for this year will be the publication of a monthly newsletter for Civil Engineering students.

Brought up as new business was the possibility of having a dance in combination with all of the honoraries.

The officers for this semester are James Stein, president; Charles Swenson, vice president; Stephen Kostecke, secretary; and Roy Peterson, corresponding secretary.

MU SAN

Preparations are now being made to gain national recognition for Mu San, sanitary engineering honorary. Recently Ken Mendelson was nominated chairman of the constitution committee, with Bob Bauman. Other elections were held and Professor Dietz and Paul Clinebell were nominated for the purpose committee; Frank Blake and Paul Clinebell for the membership committee; and Hal Sundin and Don Mullens were nominated for installation committee.

MIS

The first meeting of MIS was held in the Faculty Lounge of the Union building on September 28. This was a smoker for the purpose of acquainting new students with the functions of the society.

The smoker was opened by Bruce Capeck, president, who introduced the officers of the MIS and the faculty members of the representative schools. The program chairman, Gene Swetz, gave a brief talk on MIS past activities. He also made suggestions for the current semester which are to be taken up at a forthcoming business meeting.

ASME

At the last meeting of the American Society of Mechanical Engineers, Doctor Voskull of the geology department spoke on "Resources of the World and Their Implications."

During this meeting, there was a call for petitions from those members desiring to run for the offices of assistant treasurer, council member, and corresponding secretary.

This year's officers of the ASME are Gordon B. Chicoine, president; Jim Bienias, vice president; and Phil Dolbow, secretary.

ASAE

The speakers for the first fall meetings of the American Society of Agricultural Engineers were Mr. Leo Holman from the United States Department of Agriculture; Professor Frank Andrews, assistant professor of agricultural engineering, who spoke on the topic, "Artificial Drying of Grain;" and also Professor R. C. Hay who spoke to the seniors about the forthcoming senior inspection trip.

At the spring picnic held last May, the officers for this semester were elected. They are Jack Leathers, president; Dave Ralston, treasurer; Ray Menke, secretary; and Wayne Hartman, council representative.

The Farmer Equipment Institute Trophy Award, which is awarded annually, will be one of the society's major projects.

AFS

The first meeting of the new semester was held at the Foundry Building on September 20. This meeting was for the purpose of organizing the society's functions for the coming year.

A field trip was discussed for this fall; the date and the plants that will be visited will be announced as soon as the plans are completed. Lawrence Zylstra managed the AFS activities during the Chicago Day on October 7.

At the next meeting, Mr. Frank W. Shipley will discuss "Problems Encountered in a Job Foundry."

The officers for the fall semester are Jim Garman, president; John Rice, secretary; David Day, treasurer; and Roger Boher, council representative.

(*continued on page* 24)

presenting the science of pyrotechnics, or . . .

phantasy with a bang

by Don Sweet, E.E. '53

In conformation with the Tech's policy of keeping its articles from getting too technical, this article will not present the chemistry of fireworks. If the reader wishes this type of information, he may consult any of several manuals on the chemistry of explosives. Rather, the writer wishes to acquaint his reader with what goes on behind the scenes; that work which must be done before the show, how the various effects are produced, and what takes place in the fireworks factory.

DON SWEET

Although only a sophomore, Don Sweet has been on the TECH staff for over a year. He is majoring in EE and is an enthusiastic member of AIEE-IRE. Last St. Pat's Day, Don was on the "Explosives Detail." During the summer he was head pyrotechnician of the fireworks display at the Chicago Fair of 1950. Thus, he is well qualified to write such an article.

The first use of gunpowder was for display purposes rather than for warfare. Roman candles, which, by the way, are of Chinese origin, not Roman, were the first form of chemical warfare. Their effect was largely psychological, for they are not a very deadly weapon. It is conceivable, however, that they may have started some small fires.

Fireworks displays, especially on the Fourth of July, are used to imitate the noise, smoke, and flame of warfare. Their original use in this country was to commemorate the Revolutionary War with the "rockets' " red glare and the bombs bursting in air." Since that time, fireworks have improved, their effects, however, still based on devices of war.

Probably the best place to start a paper of this sort is with the fireworks display itself. For this purpose, the writer will attempt to describe in some detail one of the ten shows held at the Illinois state fair during 1949, under the direction of the Thearle-Duffield Fireworks company.

As the audience looks from the grandstand to the darkened infield, the show begins with a rain of red and green fire from the sky. Cluster after cluster of flaming balls burst above the heads of awestruck spectators. Before the splendor dies, the ground is illuminated by golden showers of sparks, streams of which form crosses and geometrical patterns. The smoke from these pieces is lighted with colored lights, transforming this once objectionable by-product to a thing of beauty. In between the poles which support these devices, fiery balls of gold and silver sparks are being shot twenty to thirty feet in the air.

Again the sky is split asunder, this time with many different types of fire and devices. Explosions which rock the grandstand are anticipated by brilliant flashes of light high in the sky. Whistling comets soar to the ground, apparently right over the heads of the onlookers.

Now the ground is alight again, this time with brilliant wheels which spin around on the top of their supporting poles. Following this is a huge pyramid or tree of sparks which shower to the ground in a gold and silver rain. As the tree appears to burn out, the air is split with resounding detonations which threaten to break the eardrums of the crowd in the grandstand.

And so the show goes, aerial display being intermingled with ground works. Small devices which scoot horizontally over the ground provoke laughter, and again the audience is held breathless by the white brilliance of a seventy-five-foot-long Niagara Falls.

Flaming portraits of the vice president, the governor, and the majority leader bring forth applause from the loyal party members in the audience. A fifty-by-fifty picture of a field of green and yellow corn changes as it burns to a white outline of the state of Illinois.

"Oh's" and "ah's" of wonder are heard as the sky is filled with gold. Flowers break in the sky with their stems and leaves spreading groundward then, at the tip of each stem, a golden blossom spreads in a dazzling display of beauty. The audience is not given a chance to recover before hell itself seems to break loose.

The show is into the finale. The sky is literally filled with red, white, and blue flame and resounding salutes. On the ground, tremendous explosions rend the air and "Old Glory" appears in fiery splendor.

(*continued on page* 26)

A Fourth-of-July skyrocket lights up the night. (Courtesy of Thearle-Duffield Fireworks Co.).

By Tom Tucker, Ch.E. '53; Dave Cash, Ag.E. '51; and Hank Kalapaca, E.Phys. '52

the art of sleeping in class

It is a fairly well accepted fact that engineers get less sleep than any other students. To make up for this lack of nocturnal bliss, the student must resort to some other means. The most practical solution is to sleep in class. This method is frequently practiced and has thus become an art.

The most practical time to sleep is during a lecture. It will frequently be found advisable to take a seat near the rear of the room where you may black out unnoticed by the instructor. (Some inconsiderates have definite ideas as to seating arrangement.)

One problem in this particular case is that of keeping the notebook or clipboard on the desk. The object may easily slide to the floor, thus requiring an unnecessary amount of energy to retrieve it at the end of the period. Also, certain people receive tremendous pleasure from accidently pushing a clipboard to the floor. The clipboard lands with a resounding clatter, waking both instructor and students. I have found that resting either an arm or the head on the memorandum usually will help.

The position to be assumed for napping will vary with the type of seat in the classroom. I suspect that many chairs were designed for the express purpose of keeping the student awake. The backs of most chairs are so constructed that resting the head on the back (of the chair) is the best solution. This, however, presents the possibility of snoring.

Sleeping with the arms supporting the head may result in disaster. I nearly lost my head once.

In classes where discussion prevails, other problems arise. Instructors in such classes may object to this state of activity. A friend of mine has solved this problem by learning to sleep with his eyes open, a process which I have not yet mastered.

It may be embarrassing to come to just as the instructor is asking you a question. Robert Benchley, in an essay on "Dozing" suggested a reply of, "Well . . . I . . . don't . . . know." In the classroom, however, this may be of little or no help.

The "wide-awake" appearance (left) and the "fixed" look (right) have proved, through considerable experimentation, to be the most restful class positions.

M. E.'s and C. E.'s may find it extremely difficult to sleep in drawing rooms. The stools are most uncomfortable. It may even be necessary to sleep while standing. A roving instructor will not help matters any.

For the novice it may be necessary to spend a few nights with less than the usual ten hours sleep to get into form. Pills guaranteed to keep you awake will help to induce sleep. Though the art may never be fully perfected, one should not become discouraged, for even the cruder methods will produce the desired results of lengthening one's doze period.

* * *

FLUSH YE BONEYARD

* * *

The following ad appeared in *The Daily Illini* last September 26.

"$23.25 K.&E. Log-log Duplex decitrig slide rule, case, and belt attachment —used one week—$16.50."

He gave up engineering in a hurry, no?

* * *

FLUSH YE BONEYARD

* * *

Dean Everitt and John D. Ryder, head of the EE's, along with several students and staff members of the electrical engineering department, attended the sixth annual National Electronics Conference and exhibition in Chicago last September.

Harold D. Webb, assistant professor of electrical engineering, presented a paper entitled "Selecting Critical Components for Matched Channel Radio Systems." Other staff members at the conference were Gilbert Felt, and E. C. Jordon, professors of electrical engineering; Albert Bailey, assistant professor; and Carl Skroder, associate professor. Mr. Skroder is the treasurer of the NEC.

* * *

FLUSH YE BONEYARD

* * *

Two graduates of the department of agricultural engineering have developed a new sunflower harvester. Carl Jacobs

(*continued on page* 29)

the university of illinois at . . .

navy pier

by Ray Lindahl, Arch. '53

Professor Josef-Marion Gutnayer

Assistant Professor Gutnayer is an outstanding member of the faculty of the Navy Pier Architecture department.

He received his training at the *Ecole Speciale d'Architecture,* where the internationally known architect, Auguste Perret, teaches. In the following years, he carried on a practice in Paris where he designed and built, in this period, buildings considered as pioneers in the field of modern architecture. Mr. Gutnayer considers the environment at the artistic center of Montparnausse in Paris, with its world-famous architects and artists, as the place where he formulated his architectural principles in the art of building and design.

In the short period of his work in Poland, Prof. Gutnayer was in charge of the design of a gigantic industrial project for the Warsaw Sewage Disposal plant. The design of this building now under construction expresses a noble and dignified character of industrial architecture in line with the great principles of the architecture of the past.

Since coming to this country, Prof. Gutnayer has collaborated on the design of immense projects such as the Albany Municipal airport with the engineering firm of Brinkenhoff, Hogan, and MacDonald. He worked with Skidmore, Owings, and Merrill on the Fort Hamilton hospital, and he has also designed school buildings, a home for the aged, an extensive housing project, and others.

Since his appointment to the Navy Pier branch of the University, he has concentrated upon crystallizing his architectural principles. His practice and teaching is a demonstration of the sensitivity of the directions toward the development of Contemporary Art and Architecture. He believes that " . . . it is mostly by our appreciation of the arts that we differ from the animals."

At this very moment, an important

(*continued on page* 28)

Professor Josef-Marion Gutnayer (left) chats with Auguste Perret, the French architect, at the opening of his exhibit at the Navy Pier in 1949.

navy pier societies

AIA

The officers of the Navy Pier student chapter of the AIA for the present semester were announced as follows: Ross Parkerson, president; Mal Markowski, vice president; and Joyce Davis, secretary.

This chapter was the first AIA student chapter in the country. The members have all been invited to attend the monthly meetings of the National AIA, which are held the first Tuesday of every month in the Bismarck hotel.

The speaker of the October 3, 1950, meeting of the parent society was Frank Lloyd Wright, who was guest of honor.

Several Pier students won prizes at the National Beaux-Arts Judgment held at Navy Pier last June. Francis Piech received first prize and David Kurka, second prize. Ralph Anderson, Joseph Bembenek, Thomas Klausmeyer, and George Watanabe earned first mentions.

ASME

The American Society of Mechanical Engineers, Navy Pier chapter, held its first meeting in the form of an informal discussion. Activities planned include lectures, movies, field trips, and the annual smoker. It was decided to hold the field trips during the Christmas vacation and between semesters, and to include fields of interest for both mechanical and general engineering members.

The new officers for the first semester are Richard J. Hofmeister, president; Ken Nerius, vice president; and John Grimson, treasurer.

ASCE

The first meeting of the Navy Pier chapter, American Society of Civil Engineers, was held Tuesday, October 3, 1950.

The speaker at this meeting was Mr. A. W. Irvin of the Rail Steel Corporation. The topic of Mr. Irwin's talk was, "Uses of Rail Steel in Manufacturing of Reinforcing Bars."

All student ASCE members of the chapter were invited to attend a luncheon which is being planned by the Chicago senior chapter. This is planned as a joint meeting of the two chapters.

The extensive membership drive, conducted during registration, was acclaimed a wide success. Many new members were acquired through the fine spirit shown by all older members of the chapter.

AIEE

Chief among the activities for the fall semester of the AIEE will be several field trips to different industries in the Chicago area. Some of the proposed trips

(*continued on page* 23)

"a fly-speck . . .

. . . on the face of the universe," was an apt definition once given in an English class, concerning this planet.

The article on electroencephalography in this issue of TECH may be the opening to a phase of research for which Man has been seeking for centuries—the intangible substance known as "life." Perhaps this probing of the human brain and the proving of the theory that every human emotion and thought is an electrical impulse, will shortly set down, in one concise mathematical expression, the secret of Man's existence. Knowledge of this may lead to the Age of Man Creating Man. An even later era may no longer see the "Earth" occupying its tiny niche in this corner of the universe.

We undergraduate engineers lift an eyebrow and grin at such a crackpot idea as this. On second thought, though, considering the advancing age in which we live, do we any longer have the right to label ANY idea as "crackpot?"

Engineering principles laid out the design for the electroencphalographic apparatus. Similarly, engineering devices are laying out for inspection, data from the outside universe as well as the secrets of the tiny world of atoms.

To what objective does this editorial lead? None.

Except to perhaps stimulate some thought on how the Engineer is molding the Future and what his ideologies and philosophy should be with this responsibility resting on his shoulders. Perhaps through him, this fly-speck need not disappear from the heavens.—C.W.M.

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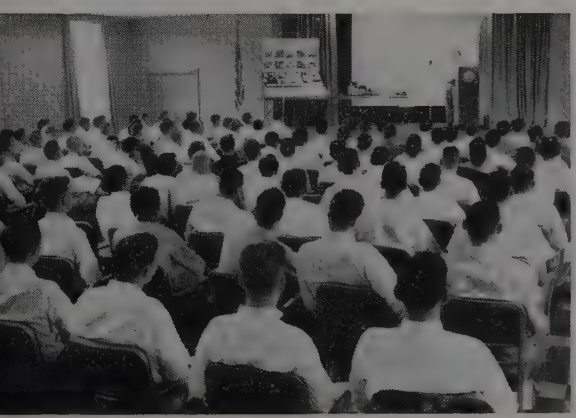

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U OF I
LIBRARY

introducing . . .

by Dick Choronzy, M.E. '51
Carl Blanyer, E.E. '51
and Bob Lawrence, M.E '51

GEORGE R. FOSTER

He's still known to some as George, principally because it was less than three years ago that he was the editor of the *Technograph*. Today, it's Mr. George Foster, and the capacity in which he serves the *Technograph* is that of faculty advisor.

It's a matter of conjecture to some who haven't met him before as to whether Mr. Foster, who has gained in stature, has lost any of the campus-

GEORGE FOSTER

student traits he possessed that short time ago. Those who have made his acquaintance or who have known him, say that he still retains that likable, boyish grin he wore during his undergraduate days.

Mr. Foster was born August 25, 1921, in Minneapolis, Minnesota. He attended some 12 grade schools—from a country school in Wisconsin to a similar one in Pennsylvania. In high school he was a member of the National Honor Society.

He spent two and a half years in the U. S. Navy, and served as an instructor during his last year and a half. After the war he taught in the New Milford grade school in Illinois.

Late in 1946, he enrolled at the University of Illinois and subsequently was circulation manager, associate editor and editor for the *Illinois Technograph*. He received his bachelor of science degree in electrical engineering in 1948.

Currently, he is assistant editor at the Engineering Experiment Station at the University. He is also studying for his master's degree in electrical engineering.

From 1948 to late this year, Mr. Foster has been responsible for the editing and publishing, and in some cases, the actual writing of the quarterly or bimonthly progress reports which are required under the terms of the various Armed Forces contracts for research in the electrical engineering department.

Last year Mr. Foster was responsible for writing some of the material and publishing the 128-page booklet, "Careers in Engineering," which is used by the College and University to answer inquiries from prospective students.

Since 1948 he has also been teaching the senior elective course in Engineering Reports, which is handled on a cooperative basis with Professors Windesheim and Heater who present the material dealing with oral reports and illustrations, respectively.

Mr. Foster was married June 1, 1947, and devotes considerable time to his wife, Florence, and their daughter, Karen Marie who is two years old. Though not a philatelist, he collects stamps—any kind, any year. He also bowls and plays golf.

Mr. Foster is deeply interested in technical writing and publishing as a future profession. It is his belief that this field is wide open to engineers who are interested in technical writing. It usually takes five to ten years for a non-engineer to acquaint himself with the technical field, but an engineer can easily fill a position of this type if he has an aptitude for writing.

JOAN HESSLER

As one of the few women in the College of Engineering and the only one in the electrical curriculum, Joan Hessler, a nineteen-year-old senior, occupies a unique position at the University of Illinois. That, coupled with her natural inclination to do many things outside of classwork, preferably at the same time, makes her one of the most widely known engineering students.

Jo was born in Ames, Iowa, and moved to Lawrence, Kansas, seven years later. She attended grade and high school there, and by skipping grades graduated two years ahead of schedule. The following fall, at the age of sixteen, she enrolled as an engineering physics student at the University of

JOAN HESSLER

Kansas. After finishing her freshman year there she attended summer school at Colorado University, and then in the fall of 1948 came to the University of Illinois. Here she switched to electrical engineering, taking the illumination option.

During her first year on this campus she was appointed office manager of the AIEE-IRE Student Branch, and publicity chairman of the St. Pat's Ball committee. Jo accomplished this while carrying a twenty-hour academic load including calculus and both semesters of physics.

But she was only warming up. During her junior year she edited the AIEE-IRE newsletter, the *What Meter;* acted as national AIEE corresponding secretary; Illuminating Engineering Society secretary - treasurer; and attendance chairman of Block I. In her spare time she took flying lessons at the University Airport.

Jo's interest in electrical engineering may be attributed to a lifelong exposure to her father's profession; Dr. V. P. Hessler is a professor in the E. E. Department. She has a wide range of talents and other interests. She can arc-weld and do wood turning, is a good amateur photographer and a competent cook. She is conversant on, among other

(*continued on page* 28)

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GEODETIC CONTROL . . .

(*continued from page* 7)

for the Lake Survey by Repsold of Germany, consisted of two parallel metal bars of zinc and steel approximately 4 meters in length and fastened firmly together at their centers; the whole assembly placed in a tube supported above the ground by tripods at each end.

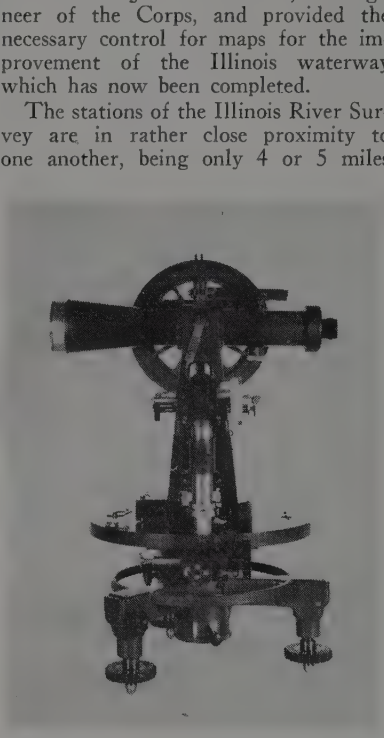
The procedure with this type of apparatus is to center one end of the tube over the station mark at either terminus of the base-line, by means of an intricate microscopic device. The opposite end of the tube is fixed and the microscope at that end is brought over the end of the bars, the microscope is clamped and the tube is raised off its tripod and carried forward to place the rear end of the bars under the former front microscope. The front end of the tube is placed on another tripod on the line of the base and the microscope at that end is brought over the ends of the bars as before.

Measuring the Chicago base-line in both directions with this apparatus required 54 days. The average distance measured per day was 958 feet, the greatest distance measured in one day being 1,640 feet. Total length of the Chicago base-line was 24,635 feet. A base measured near Fond du Lac, Wisconsin was used in computing geographic positions between it and the Chicago base. The length of the Chicago base computed through 29 triangles or 150 miles from the Fond du Lac base was found to be ± 0.275 feet different from the actual measured length!

Certain of the stations established by the Lake Survey in 1874-77 were utilized by the Corps of Engineers in executing a triangulation along the Ship Canal and Illinois River in 1910.

This triangulation, designated as the Illinois River Survey, was under the direction of J. E. Woerman, an engineer of the Corps, and provided the necessary control for maps for the improvement of the Illinois waterway which has now been completed.

The stations of the Illinois River Survey are in rather close proximity to one another, being only 4 or 5 miles



A theodolite is used for the precision work required for geodetic surveying. (Courtesy, U.S.C.G.S.).

apart to give a close check on the accuracy of the large scale plans drawn for the waterway.

Several stations of the Lake Survey which could be recovered, were occupied by a field party of the U. S. Coast and Geodetic Survey in 1944 to determine distances between selected points for the U. S. Army Air Force.

A few new stations were established at this time and as many of the Lake Survey monuments as could be found 70 years later were reset with concrete posts and tablets explaining the purposes of the mark. The latest year that a triangulation party operated in this area was 1944.

Summarizing, a triangulation provides the basic framework for maps of even minor accuracy, since its existence or the lack of it means the difference in maps of great value or worthless for engineering applications. The Chicago area has been inadequately covered by triangulation by reason of the great distance between the stations. Were it not for supplementary stations established by other methods of survey, adequate accurate control of this area would not exist.

Topographic Mapping

The first topographic mapping in this area was by the United States Geological Survey in 1889, using reconnaissance methods based on a very few control points. The region was also mapped geologically at this time and the results printed in an interesting report showing the surficial geology of the region.

By 1925 the rapid growth of the city had made the old 1889 maps obsolete, also the sparsely located control monuments made it difficult for local surveyors to determine the location or elevation in relation to a fixed point. Accordingly an agreement was entered into by the Illinois State Geological Survey and the United States Geological Survey to map Cook County on a

(*continued on page* 22)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233)

Of The Illinois Technograph published January, February, March, April, May, October, November, December, at Urbana, Illinois for October 1, 1950.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Illini Publishing Company, Champaign, Illinois;
Editor, C. W. Minnich, Urbana, Illinois;
Business manager, William Anderson, Champaign, Illinois.

2. The owner is: the Illini Publishing Company, a non-profit corporation.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: none.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

William A. Anderson, Business Manager.

Sworn to and subscribed before me this 9th day of October, 1950.
(SEAL) Margaret E. Cain
(My commission expires December 21, 1950.)

Coming---

in the December issue:

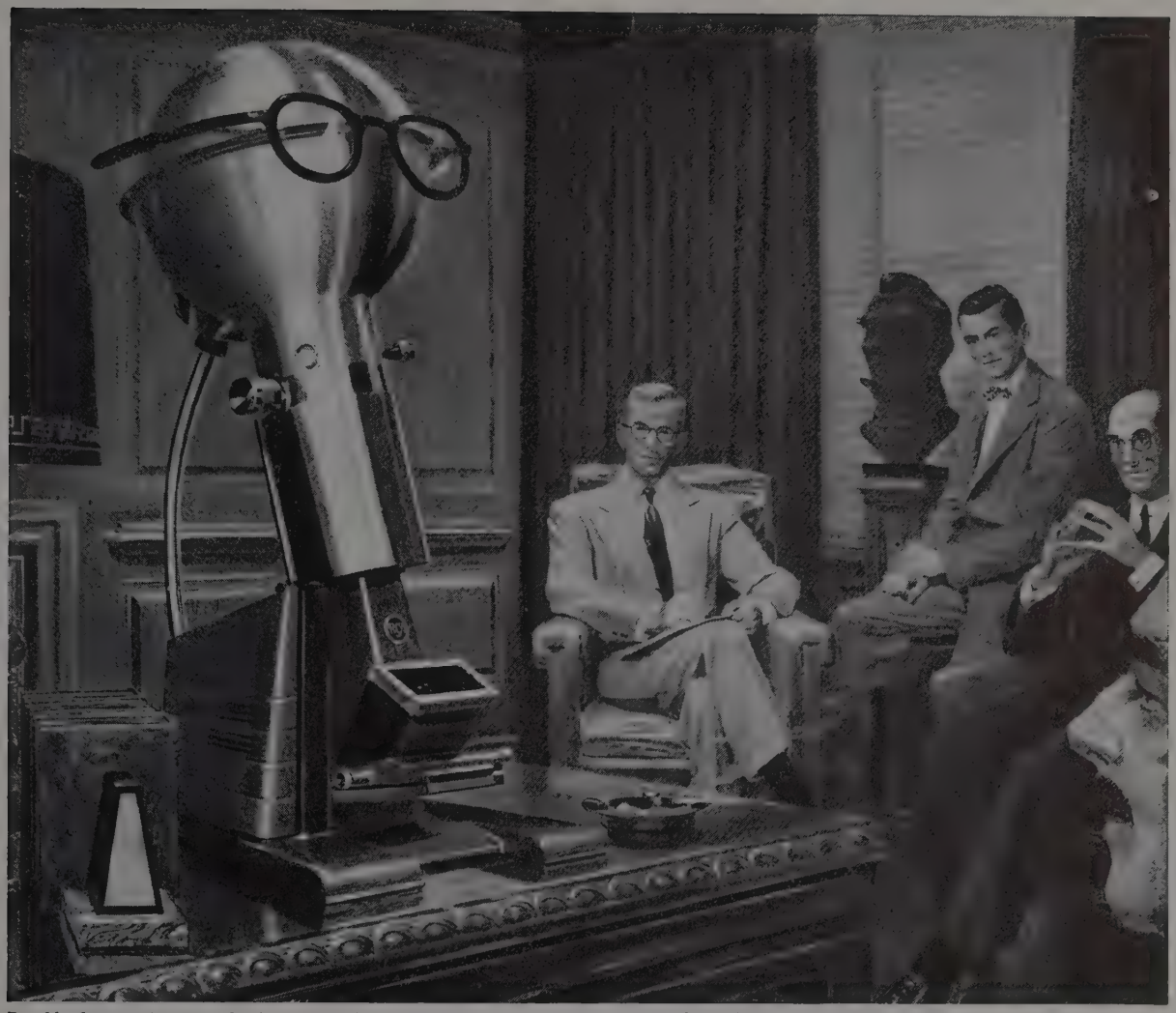
. . . Oil of the Future

. . . Perpetual Motion

. . . Color Television

. . . Report on Senior Inspection Trips

. . . The Flying Saucer Saga



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GEODETIC CONTROL . . .

(*continued from page 20*)

scale of 1" to 2000 feet (1:24,000).

It was determined that the number of control points necessary to furnish accuracy to the proper degree for the maps on the selected scale could only be provided by an extended traverse net covering the entire county.

The methods of running a traverse are similar to a triangulation with several notable exceptions. A traverse is run entirely on the ground with distances between stations of only a few hundred feet. All distances are measured with a steel tape and angles from station to station are read with a transit. Third-order accuracy in this work is acceptable.

Checking a traverse provides for lines to be run in a grid pattern, each line beginning and ending at a point whose geographic coordinates have been determined. Further checks are made by connecting a traverse line to be an existing triangulation station.

In Cook County lines of traverse were run on many of the major highways and the geographic coordinates of section corners, road intersections, prominent landmarks, etc., were determined. Railroad trunk lines were also utilized for this purpose, the traverses extending almost to the doors of the depots in downtown Chicago!

The total length of traverse lines run to control the Chicagoland topographic maps was 493 miles.

Later plane-table parties utilized many of the traverse stations as check points in their field drafting of critical portions of the county. Not all of the county had to be mapped by plane-table as aerial photography provided the remaining cultural information.

Leveling

Upon completion of traverse work, level parties took to the field, determining elevations above mean sea level for all of the monuments set during the traverse in addition to many supplementary points.

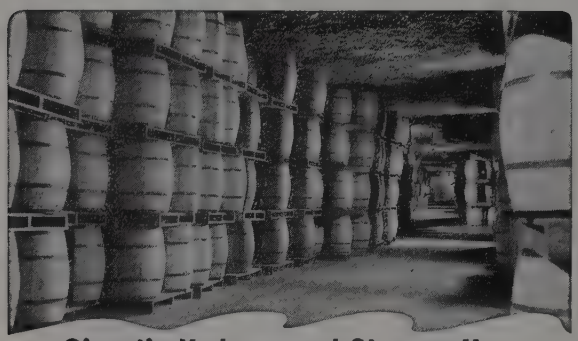
For vertical control of topographic maps, third-order accuracy is specified by the U. S. Geological Survey and this is accomplished with an engineer's wye level. Elevations are determined to the nearest .001 foot.

Lines of accuracy greater than third-order were run by the Corps of Engineers along the Illinois and Michigan Canal in 1903, and by the Coast and Geodetic Survey on the Milwaukee Railroad from Savanna to Chicago in 1883. The latter survey also ran a line of levels on the Rock Island and New York Central Railroads into Indiana in 1916. Parties of the Geological Survey tied their level circuits into these lines of greater accuracy to bring the entire survey into the National level net.

Thus the Geological Survey after running 464 miles of levels adequately controlled their maps of Chicago and vicinity. Permanent monuments were set at convenient places and their elevations were determined to a sufficient accuracy to make them useful for future work.

While not being geodetic in nature, permanent monuments set by the Bureau of Sewers of the City of Chicago are worthy of notice. These bench marks—monuments whose primary purpose is to provide elevations rather than geographic coordinates—are set by the Bureau to third-order or greater accuracy. The work has been in progress for about 50 years and the elevations have been checked and rechecked with federal monuments so that for all purposes it may be said that these marks are of geodetic accuracy.

During the latter period of the national depression in 1934 and 1935, the federally constituted Civil Works Administration undertook an extension of the vertical control lines in Northern Illinois. These level parties were under the supervision of personnel of the Coast and Geodetic Survey with the party being made up of local unem-



Gigantic Underground Storage Uses

Frick Refrigeration

Originally a limestone quarry, the Natural Cooler Storage of the U. S. Dept. of Agriculture near Atchison, Kansas, is one of the largest refrigerated warehouses in the world, having capacity for 3,000 carloads. A temperature of 32 degrees F. is held in the great cave by two Frick 4-cylinder compressors, driven by motors totaling 600 horsepower.

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ployed men with survey experience.

Lines run by the C. W. A. at this time included a releveling of the 1883 Coast and Geodetic Survey line on the Milwaukee Railroad from Savanna to Chicago. Many of the old monuments had been destroyed and this survey replaced them. A new second-order line from Chicago to Milwaukee on the North Western and Milwaukee Railroads was also run by this party. Considerable work was done in the Fox River valley and westward, bringing formerly uncontrolled areas into the national level net.

At the present time the Cook County Highway Department is executing a precise level survey around the country and outside the city of Chicago. This work is under the supervision of an employee of the Highway Department who has trained with Coast and Geodetic Survey personnel. The instruments and methods used in surveying are comparable to federal first-order work.

The plans of the Highway Department call for a bench mark each ½ mile on the township lines and additional marks on the routes of the projected superhighways. About 500 miles of levels have been run up to this time, some with federal assistance.

The Coast and Geodetic Survey will compute and publish the elevations for the monuments set by the Highway Department insuring geodetic accuracy for each mark.

In summary, extension of the original Lake Survey horizontal control was accomplished by traverse primarily intended to provide accurate data for the Chicago topographic map. In addition, many miles of levels were run throughout the area so that adequate vertical control can now be said to exist.

Applications of Geodetic Data

As stated previously the primary purposes of a geodetic survey is to provide geographic coordinates and elevations of known points for the construction of accurate maps and charts.

How may this data be utilized by the engineer who is familiar with plane surveying but not so familiar with geodetic operations?

For one thing, the geographic coordinates for all triangulation stations have also been given in terms of plane coordinates on a definite state-wide grid system. The use of plane coordinates in reference property corners is increasing. Referencing a piece of property to a triangulation station is literally putting that piece of property on the map.

The engineer can run a simple traverse from the triangulation station to the corners of the property in question. Then, on forms provided by the Coast and Geodetic Survey, he may compute the plane coordinates for each corner. If desired, the coordinates which are on an X and Y system may be expressed in terms of latitude and longitude.

The uses of bench marks are numerous. Any work which requires a reference to a point of known evaluation must have accurate vertical control monuments. Such projects as highway and railroad construction all involve the setting of grades. Often these projects are of such magnitude that the only method of checking the accuracy of the engineer's work is to refer the termini of the project to a geodetically determined bench-mark. In fact, all profiles submitted by railroads to the Interstate Commerce Commission in compliance with the valuation order must have a reference to sea level elevation.

In general, results of geodetic operations are published by the department that executed the survey. All the engineer need do is to write the department stating the extent of his requirements and the full descriptions, geographic coordinates, or elevations for monuments in his vicinity will be furnished him.

The increasing uses of geodetic stations and the accuracy of information about them bind the engineer to use every care in preserving these monuments. They represent not only time and effort, but the considerable funds (usually taxpayers') spent to establish them. Often persons ignorant of the purposes of these monuments have destroyed their usefulness in the quest of souvenirs, or for some other reason. When a survey monument is lost the effects are not immediately noticed. But when an engineer comes to use the monument and finds it destroyed its value becomes apparent.

There is a federal law prescribing fines and punishment for persons maliciously destroying government survey monuments; however, it is far better to acquaint all persons with the purposes of these marks so that their usefulness and value may be appreciated.

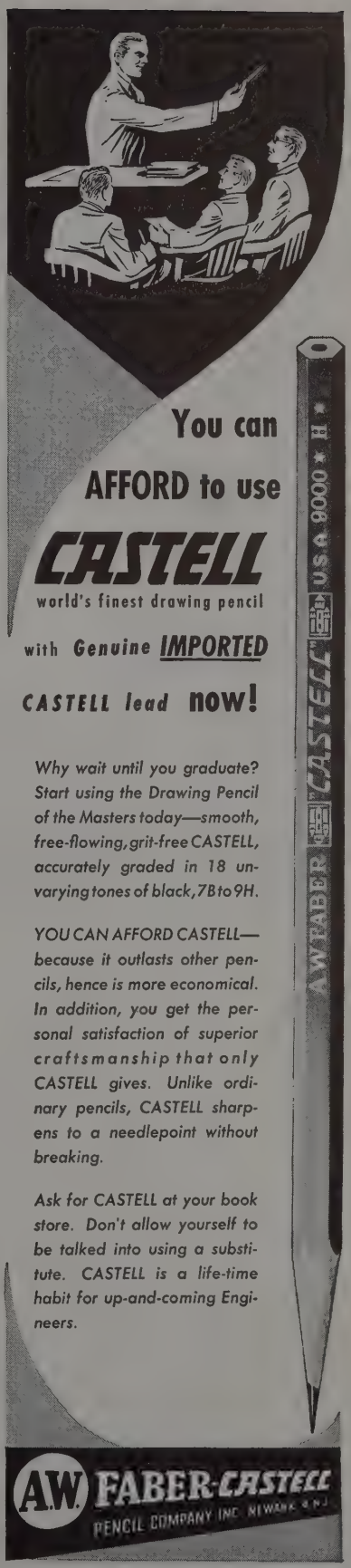
PIER SOCIETIES . . .

(*continued from page* 13)

are to the new Commonwealth Edison Ridgeland Avenue Station and to one of the television stations. Many other fine activities such as lectures and movies are included in the schedule.

At the October 5, 1950 meeting Mr. Blaine D. Wickline, television engineer for the Illinois Bell Telephone Company, gave an illustrated lecture dealing with the problems involved in transcontinental television.

The officers for the fall semester are Gordon Peterson, chairman; Henry Musal, vice chairman; and Joseph Rush, secretary.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ELECTRO . . .

(*continued from page* 9)

encountered in this type of circuit. Although imperative in some phases of bio-electric work, frequency response from one cycle per second down to direct current is of little interest in the usual encephalogram.

Transformer coupling is feasible but design would be difficult because of stray magnetic pickup in the low level transformers, and core saturation at the low frequencies.

The unusually low frequency response required necessitates a time constant of at least .5 second. The advantages of using push-pull in early stages are: (1) avoidance of extraneous pick-up, (2) freedom from interference between channels and, (3) improved amplifier stability.

The operation of the push-pull circuit is such that a differential (out of phase) signal must be applied to the input grids for amplification to occur. All voltages applied in phase will produce the same change in plate current in each tube. If the circuit is balanced and the tube characteristics are identical, the net change in voltage between plates will be zero; and there will be no signal output. However, a change in grid voltage (e_g) applied as an increase to one grid and a decrease to the other, will cause a relative plate voltage proportional to ke_g where k is the stage gain.

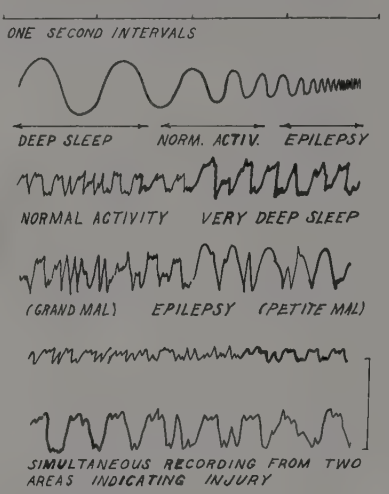
Since neither side of the input circuit must be grounded in the push-pull circuit, most extraneous pick-up will occur as in-phase voltage on the input. By proper design, balancing can be made so nearly perfect that no more than 1/50,000 part of the unwanted signal between ground and the two grids is amplified. The tapped resistor is usually provided to obtain optimum balance. The use of the dual triode constructed with both units around a common cathode such as the 6SC7 reduces the effect of variation of tube characteristics.

The other important advantage of push-pull is that it allows two or more channels to be operated independently of each other, making it possible to observe waveforms from several areas of the brain simultaneously with interreaction. For this reason the use of a single ended amplifier design is undesirable since the coupling occurring by virtue of a common ground effectively connects half of the electrodes in use together.

Inverse feedback is used to further discriminate against in-phase potentials. A simple feedback scheme is to connect the input grid return to the common cathode resistor in stage two. In-phase potentials increase the total current flow through the cathode resistor of the second stage. The voltage thus generated by this increased current flow is 180° out of phase with the in-phase potentials on the input grids.

Output Stage and Recording System

As the recording system is usually a magnetic drive linked to a syphon pen, power is required for its operation. The triode is more satisfactory as a power amplifier since a lower plate resistance simplifies the problem of impedence matching. It is interesting to note that



The above are EEG recordings of various types of brain waves.

design of an output transformer capable of operating down to one cycle per second would be difficult due to core saturation at this low frequency. One satisfactory recorder was constructed using a permanent magnet field yoke, a 300 ohm voice coil, a simple lever system, and length of hypodermic tubing for the pen. In this case, the power loss due to the miss-match from the tubes to the 300 ohm coil was considerable but was preferred to frequency discrimination and distortion had a transformer been used.

The piezoelectric effect was applied to the inkwriter problem by Offner in 1936. Disadvantages of the Rochelle salt crystal unit are an increase in sensitivity with temperature and hysteresis; i.e., a given signal may cause an upward deflection of 5 *mm* and a downward deflection of 4½*mm*.

Construction

In practice, wire wound resistors must be used in low level circuits as the carbon type produce too much noise. Likewise, oil filled condensers are desirable to reduce leakage to a minimum. The value of plate resistors in the first stage is critical with respect to noise and should be kept as low as feasible.

Freedom from mechanical vibration of the low stages is essential. This may be achieved by shock mounting and isolation of the preamplifier unit.

Due to the very low input level, the intensity of 60 cycle fields in most buildings, and the nearness of 60 cycle frequency to that of brain waves, complete shielding is absolutely necessary. The patient must be placed in a screen cage carefully bonded together and grounded at a single point. Nearby motors, power cables, and telephone lines must also be shielded.

Resonant filter circuits are often used to effect a 30 decibels decrease in 60 cycle interference. However, the frequency response of the amplifier is then flat to only 45 cycles per second or lower.

Conclusions

The waveforms recorded probably consist of many separate waveforms, each originating from some particular locality in the brain and superimposed upon each other. The difficulty in localizing the source of the potentials is of course aggravated by the necessity of attaching the pickup electrodes externally and not to the specific areas of the brain being studied. Perhaps it will be possible to isolate these potentials and correlate them with specific action or thonghts.

One of the most exciting future outgrowths of brain potential study may be a means of supplementing or supplanting an impaired or destroyed sense. Experiments have been conducted in which a deaf person was made to hear by direct electrical stimulation of the auditory nerves. The author believes that similar stimulation of the optic nerve may someday be realized, perhaps allowing partial restoration of sight to the blind by electronic means.

In the field of electroencephalography, there remains much to be accomplished. Although the present techniques are highly developed and of considerable value in medical diagnosis, there remains many channels of research with the possibility of opening new techniques and applications which may yield information on the structure and operation of the brain.

SOCIETY NEWS . . .

(*continued from page* 10)

SAE

Mr. G. E. Burks, chief engineer of the Caterpillar Tractor Company, spoke recently at the SAE meeting on "What Does the Designer Really Do?"

After the discussion, an advertising and program committee was formed to plan future meetings.

TO MY ROOMMATE

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STANDARD

PHANTASY . . .

(*continued from page* 11)

The show is over. In fifteen or twenty minutes, little longer than it has taken to tell, $1,000 worth of material and labor have gone up in smoke. It took eight men all day to prepare the show, and now they are ready to repeat the job tomorrow.

All the effects of the show just described were produced by a few basic pieces of fireworks material. These basic items include shells, rockets, tourbillions, lances, Roman candles, gerbs and assorted noise-makers, including firecrackers three inches in diameter and sticks of dynamite. It is the fireworks crew's job to combine these pieces in a predetermined arrangement to produce the desired spectacle when fired.

Perhaps a brief explanation of the various pieces and their effects is in order. Shells and rockets are similar in that both are aerial pieces. They are different, however, in most other respects. Although the audience may think they are seeing sky-rockets when they see aerial displays, they are not unless the show is being fired over water or in a very barren area.

The reason is simple. The sky-rocket consists of a tube of powder called "propellent" or "rocket composition." When this powder burns, it forces a stream of hot gases out of a small hole in the back of the rocket. This forces the rocket in the opposite direction in accordance with the law of action and reaction. The rocket is being driven all the way up to its peak of ascension. To balance it in flight, it is provided with a long stick which extends in back of it. It is because the paper tube containing the propellent and the stick sometimes catch fire that the rocket is not used over populated areas. The burning stick and tube could easily set a fire where they fell.

In lieu of the rocket, the shell is used. The shell does not have the fiery tail behind it as a rocket does, but it is safer. The safety lies in a different means of propulsion. The shell consists of two parts, the case containing the stars and whatever devices are to be released in the air, and another section containing the "lifting charge." The shell is fired from a mortar or pipe. Its principle of propulsion is exactly the same as that of a bullet. All the force is applied to it while it is in the mortar. When the fuse is lit, a time fuse to the contents of the case is lighted, along with the lifting charge. The time fuse is timed so as to release the contents of the case at about the peak of elevation, which may be anywhere from 300 to 1,000 feet in the air.

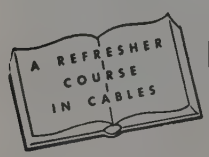
Shells come in five standard sizes, three, four, five, six, and eight inches in diameter, and cost anywhere from $1 to $75 each. Eight-inch shells, although not commonly used by smaller fireworks companies, can be had from most companies by special request.

The outward appearance of the shell gives no indication of the beauty and splendor it will release when lighted. Many shells are wrapped in dull brown kraft paper and look like a cylindrical object wrapped in a common grocery-store sack, the neck of which has been tied with a rope. Actually, this "rope" is the fuse for the shell. The shell is put into the gun or mortar, fuse end up. When ready to fire, the operator merely lights the end of the fuse.

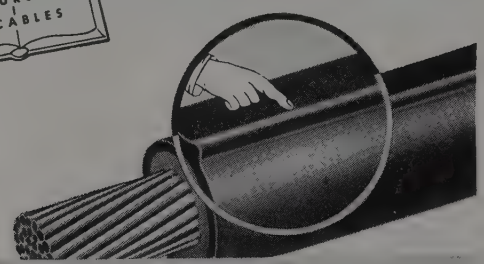
Closely akin to rockets because of the powder used in them are "skimmers," "wheel-drivers," and "tourbillions." Skimmers are the comical devices which skim along parallel to the ground. They are fired in pairs, one starting from each side of the field. It appears as though they will collide in the middle, but they never do, and for a very good reason. The skimmer is actually a small rocket without a stick. It slides across the field on a wire. A double-track system is used, one wire for each direction.

A wheel-driver is just what its name implies. It furnishes the motive force

(*Continued on page* 28)



LOOK FOR THIS RIDGE



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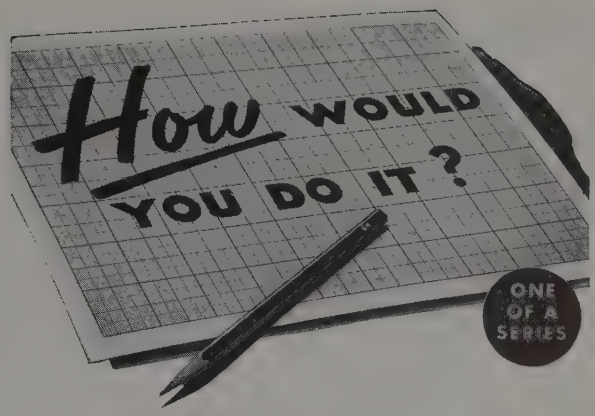

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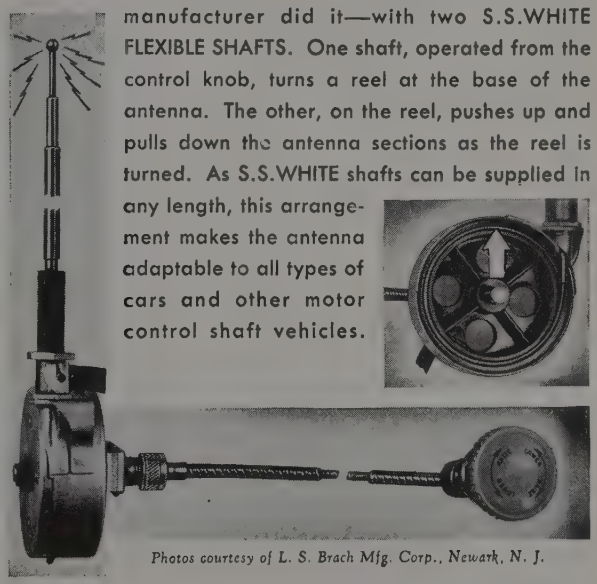

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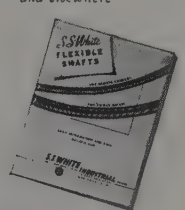

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PHANTASY . . .

(*continued from page* 26)

for wheels. Spectacular in its own right, giving forth a stream of sparks, it is usually combined with other pieces, bright flares, gerbs, or some other device. It, too, is just a rocket without a stick.

The name "tourbillion" comes from the French. In full it is *tourbillion de feu,* or whirlwind of fire. The tourbillion consists of a paper tube approximately two inches in diameter and twelve inches long. The walls of this tube are very thick. It is filled with rocket composition. A narrow stick is nailed to the tube crosswise at the center. In use, the tourbillion is placed on a flat surface, stick down. Once lighted, it spins around at great speed, and then rises into the air several feet.

Also similar to a rocket in composition is the device called a "merry-go-round" or, briefly, "merry." It is made up of two tubes identical to those used in the tourbillion. The tubes are both glued endwise to a wood rod so that the merry is somewhat over two feet long. The wood plug at the center is drilled for a nail which will serve as a pivot. When lighted, a stream of sparks and hot gases shoots through holes in the sides of the tube at the end farthest from the pivot, causing the tube to spin with great speed.

Besides the various rocket devices, there are a few more basic pieces used in the show. One of the most important of these is the gerb. A gerb produces a shower or fountain of sparks. It, too, consists of a paper tube similar to those previously mentioned. These are filled with a powder composition containing a high percentage of powdered and flaked metal. Whether the gerbs are gold, silver, aluminum, or some other color depends chiefly on the other ingredients in the mixture and not the metal used. In use, these tubes are fastened to poles so that the streams of sparks they produce will cross and form patterns.

When made up on poles like this, the whole device is called a totem pole. Gerbs also were used on the tree or pyramid described in the first part of this article. Gerbs are often used in conjunction with merries or wheels, and in general, form a very useful part of the pyrotechnician's material.

Similar to the gerb is the cascade piece. The mixture in the cascade piece, or shower stick, as it is sometimes called, is largely magnesium to produce the intense white light of Niagara Falls. Also, the mixture is not rammed in the tube with as great a pressure as that in gerbs. This allows the mixture to flow toward the ground as it is burning. The Niagara piece consists of shower sticks strung along a rope, one placed every eighteen to twenty-four inches. The rope is then suspended between two poles so that it is twenty-five or thirty feet above the ground. When fired, the showers of sparks from adjacent cascade pieces blend to present an unbroken wall of silvery sparks.

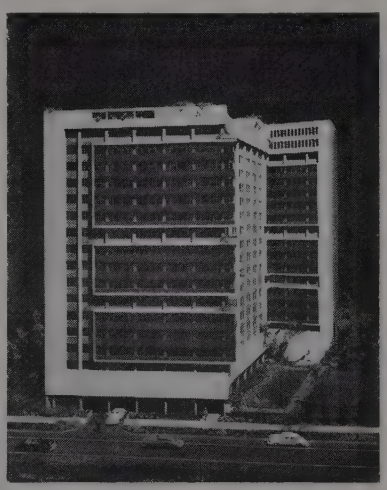
(*To be concluded in December issue.*)

NAVY PIER . . .

(*continued from page* 13)

building of the Chicago lakeshore skyline is under construction (see picture). The design of this building includes the most advanced principles of construction, composition of three-dimensional masses, and use of materials, texture, and color. It is a new type of immense composition in scale with the Chicago skyline.

At the present time, he is designing a project for the Chicago Housing Authority, which has labeled it a gem among the other projects because of its principle of "residences in the sky." This means that every one of the 155 apartments in planned in such a way that permits a maximum of air, sun, and scenery, but that still gives absolute privacy to its occupants.



The above is a small-scale model of the proposed Lake Shore Drive Apartment Building. (Courtesy, Hedrick-Blessing Studio).

The possibilities of the use of prestressed concrete are now under study, and, if this building material proves satisfactory, the Housing Authority project will be the first high-rise prestressed concrete building in the world. The building is being designed in collaboration with L. R. Solomon and J. Vaughan, and engineers Kent Preston (from the Roebling Corp.) and Eugene Dubin. The project will be built on the corner of Oakwood and Lake Streets in Chicago, and will offer a wonderful opportunity for students to follow the construction of an entire building.

It is Professor Gutnayer's belief that it is only through the observation of the developments of modern materials and methods of construction that a new style of modern architecture can take birth. He explained that the materials of tomorrow can be applied today, if the architectural profession has enough courage and thorough knowledge of the mediums they employ. The observation of past progress is a necessity in order that the modern student can take advantage of the past and avoid the mistakes of his predecessors.

INTRODUCING . . .

(*continued from page* 18)

subjects, modern science, music, and philosophy.

Her interest in the curriculum centers around spectrophotometry and technical illumination. Jo has made no definite plans for her career after graduation this next June, but she will probably work in industry. And whatever she does, it's bound to be unusual and successful.

VICTOR SWENSON

Many men have gone into the engineering field and found that they were handicapped by the lack of a proper college education. Victor E. Swenson, a senior in mechanical engineering, realized such a handicap while working for six years in the engineering field. In 1947 he decided to enter the University of Illinois at Navy Pier, and in 1949 he transferred to this campus.

Vic has been an active member in the student branch of ASME for the past three years. He was chairman of the Chicago Navy Pier branch in 1948 and 1949. While he was in office, the ASME organized the Engineering Council; sponsored an all-University meeting featuring a specialist on atomic energy, and promoted the St. Pat's Ball. He was chairman of our local ASME exhibit in the engineering open house last year; and, this year he is chairman of programs. He is also a member of Phi Eta Sigma and Sigma Tau.

Vic was born and reared on a farm near Belleville, Kansas. He went to high school in Belleville and was active in the dramatics club, Hi-Y, F.F.A., and 4-H club. He graduated in 1940 and took an extra year as a post graduate.

The summer of 1941, he went to Kansas State College at Manhattan, Kansas, to take a defense training course and the following fall he was a civilian

employee in the drafting department at Fort Riley, Kansas.

In January, 1942, Vic went to Detroit to work for the U. S. Lake Survey, and six months later transferred to the tool and die industry.

He moved to Chicago in 1944 and was employed by the Gautner Scientific Corporation as a design draftsman. He

VICTOR SWENSON

remained with this company until he entered college in 1947.

Vic was married in 1946 to Jean Nelson of Lake City, Minnesota.

He is looking toward design work upon graduation—preferably in the field of internal combustion engines and their accessories.

Surveying Prof: "Did you bring a fieldglass with you?"

C.E.: "Never mind that. We can drink just as well out of this flask."

* * *

"Doctor," said the well-dressed student, "my trouble is dreams. I always dream the same dream—it's about a girls' dormitory and the girls run lightly clad from room to room."

"Ah, yes—and you want me to make you stop dreaming about the girls?"

"No—No—all I want you to do is make them stop slamming the doors."

* * *

The gas company in a small college town had inserted the following advertisement in the local newspaper. Wanted: Hard boiled, beauty-proof man to read meters in sorority houses. We haven't made a dollar in two years.

* * *

"This is a splendid fit," said the tailor as he carried the epileptic out of the shop.

BILGE . . .

(*continued from page* 12)

and Warren Kent, both of whom graduated this summer, made the initial design and constructed the machine. Staff members and the Agricultural Experiment Station made changes in the original design.

Although sunflower seed is considered a profitable crop for midwestern farmers, high harvesting losses have discouraged their growth. The new harvester is expected to cut losses in half.

The machine consists of a standard grain combine with a harvesting attachment of gathering chains and sheet-metal snouts similar to those used on cornpickers. The chains carry the stalks back to a knife where they are cut off and dropped on the elevator canvass of the threshing machine. The seeds are then removed by the ordinary threshing machinery. The snouts are used to lift fallen stalks into the chains.

* * *

FLUSH THE BONEYARD

* * *

Nathan M. Newmark, research professor of structural engineering, received the Moisseiff award from the ASCE last year. The award, which is given to the most important paper in the field of structural design published in the Transactions of the Society, was made for Mr. Newmark's paper, "Design of I-Beam Bridges."

Mr. Newmark, a native of New Jersey who received his B.S. from Rutgers, has been with the department of civil engineering since 1930. During his graduate work at the University he served as a research assistant. He received his master's degree in 1932, and his doctorate in 1934. Upon graduation from the University, he was appointed to the staff of structural engineering. He has held the posts of research assistant, research assistant professor, and research professor, the latter advancement coming in 1943.

During World War II, Mr. Newmark served with the National Defense Research committee and the Office of Scientific Research and Development. For a part of 1944 and 1945 he was in Hawaii with an operational research group of the OSRD.

Professor Newmark has been a consultant on several projects in structural engineering and mechanics. He has also been associated with various military activities, including consultant to the Corps of Engineers and special programs of the Air Force and Navy. In 1944 he received the James R. Croes medal from the ASCE.

(*continued on page* 30)

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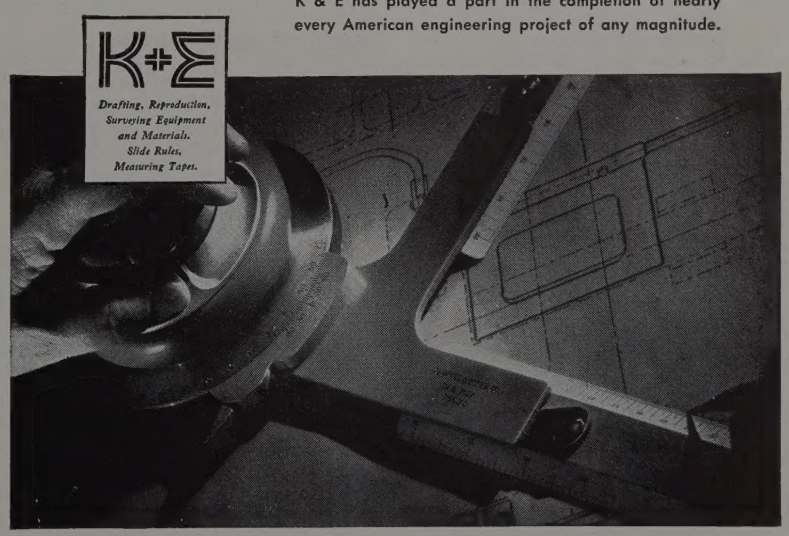

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BILGE . . .

(*continued from page* 29)

While looking through some old issues of the *Tech* we came across some jokes that caught our attention and thought we'd pass them on to you.

Back in 1921, an engineer's definition of a slide rule went like this:

"A slide rule is something like a woman. It is slippery and no one ever learns to manage one. It has a variety of figures which are more or less true. Men are crazy until they get one and, after they get it, wish they had saved their money. But unlike a woman a slide rule can be put in a leather case and shut up."

* * *

FLUSH YE BONEYARD

* * *

Here is an excerpt from a 1924 editorial which gives an insight into campus morals:

"This semester there has been a continual growth in the number of men who smoke on the campus. Evidently, there is little regard for this one distictive tradition of our campus, and unless student spirit changes at once, the tradition will be but a memory. . . ."

* * *

In 1925, this joke had them rolling in the aisles:

"We present the following admonition to freshmen; how to drink from fountain on third floor:

A. Place books on floor.
B. Apply mouth to orifice.
C. Grasp hat with left hand.
D. Press button with right hand.
E. Have janitor wipe brains off ceiling."

* * *

FLUSH YE BONEYARD

* * *

Perhaps you remember the poem entitled "Little Ion" which we published last spring. Here is another bit of verse which, though the author is anonymous, appears to come from the same pen.

* * *

CHEM. 124's PSALM

I have a chemistry professor,
I shall not pass,
He maketh me to show ignorance
Before the whole class.
He giveth me more than I can learn,
He lowereth my grades.
Yea, though I walk
Through the Valley of Knowledge,
I shall not learn.
He annoyeth my head with problems,
My eyes runneth over.
Surely burets and balances
Shall follow me all the days of my life,
And I shall dwell
In the Quant. lab for ever,
and ever,
and ever!

NEW DEVELOPMENTS . . .

(*continued from page* 2)

perimental leg-bone models have shown that internal stresses in human bone structure—such as those caused by fractures or heavy blows—can be clearly viewed and analyzed.

where cars are king

Chrome and gadget-conscious though Americans may be in selecting their new cars, few have followed the tastes of some foreign buyers.

Automobile Facts cited the recent visit of the Shah of Iran to the United States. Before returning to his native lang, he bought a turquoise-blue convertible coupe complete with radio, heater, spotlight, foglights, back-up light, license plate frames, gas-tank locking cap, and convertible top boot and bag.

By his special orders, the company also added an altimeter, cigar lighters in front and rear, a clock in the rear, a speedometer reading in kilometers and an extra set of keys.

Another common instance occurs in the forbidden kingdom of Nepal in the heart of the highest mountains of the world, the Himalayas.

The only roads exist in the central valley around the capital city of Katmandu, and, although new cars are often imported by wealthy potentates, getting them over the steep passes presents a major problem. This, however, is easily solved in Eastern fashion by the labor of 60 to 120 coolies who carry a new car—wheels and bumpers removed for the journey—on a huge framework of poles on their shoulders.

better tasting water

An instrument known as a "dewpoint recorder" is helping give a spring-water taste to water from the Schuylkill river in Philadelphia, Pa., in a new purification process that uses no unpalatable chemicals.

Largest water purification installation of its kind in the United States, the new Welsbach Corporation plant here uses ozone, a form of oxygen, to kill river bacteria. The Welsbach installation is the only one of several purification plants here using the new method.

Engineers said that ozone is produced in the process in the same way a bolt of lightning produces it. The "electrical" odor, detectable in the air after a lightning stroke, is actually the odor of ozone, they said.

As the air passes over the metal plates which cause the electrical discharge, it must have a very low moisture content. To assure that the amount of moisture in the air remains constant during the process, the dewpoint recorder is used. Designed and built by engineers of GE, the instrument gives a continuous record of air dryness, accomplishing this by measuring and recording the temperature at which moisture in the air condenses on a mirror's surface, engineers said.

The ozone is bubbled through river water from which the sediment has been allowed to settle. Being an unstable gas, the ozone breaks down again into ordinary oxygen, and in the process it kills the bacteria in the water.

Finally the water is filtered and pumped into city mains, with only a trace of chlorine added to protect its purity from the time it leaves the reservoir, until it reaches the city's water faucets.

servomechanism-kit

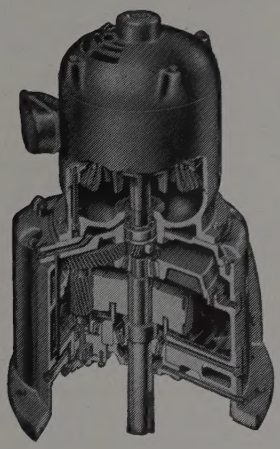
A new type servomechanism kit, which is capable of solving complex automatic control device problems, yet can be assembled as easily as a toy erector set, has been developed for commercial use in industrial laboratories as well as for demonstration and experimentation in colleges and universities. This high-performance servo "package" provides a unique facility for experimental work in industry and for the instruction of servo system techniques in preparing graduating engineers for advanced development work in electronic, television and associated industries.

The Claude Neon servo kit solves one of the toughest and most expensive problems facing the development laboratory in designing new mechanisms—translating the blue-print or schematic diagram into a working model. By providing a number of basic high-precision parts, which can be experimentally assembled and reassembled where necessary on a "breadboard," the servomechanism kit helps the engineer interpret the "rights" and "wrongs" in equipment design, eliminating the need for expensive drafting, machining and assembly work.

The new unit consists of a transmitter and receiver constructed on separate breadboards. The servo may be operated as any one of three basic types of servos by making only slight electrical changes: a two-speed synchro servo; a potentiometer follow-up servo; and a velocity servo (electro-mechanical integrator). Both transmitter and receiver have a high precision fine and coarse dial geared 36:1. The transmitting servo has a hand input which may be disengaged if a motor drive is incorporated.

All units embody the latest in high performance servotechniques. Amplifiers include integral and derivative stabilization and the servo motor operated directly from the plates of the amplifier output tubes.

Another page for **YOUR BEARING NOTEBOOK**

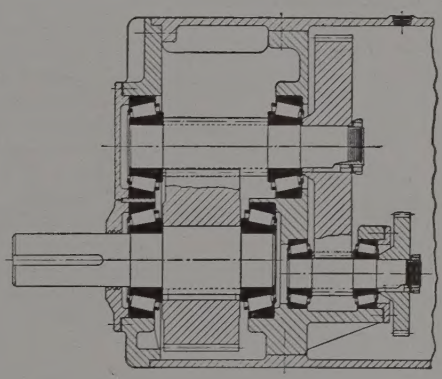


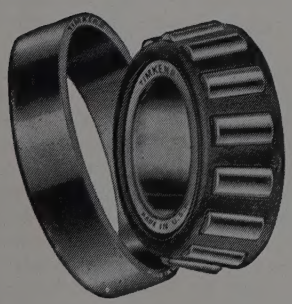
How to help a gearmotor take care of its teeth

To minimize wear on the teeth and to insure smooth, quiet operation, reduction gears in motors like this must be held in perfect mesh, no matter what the load. That's one reason why engineers mount the gear shafts on Timken® tapered roller bearings. Timken bearings hold the shafts in accurate alignment. Gears are kept perfectly positioned, with each tooth meshing smoothly and carrying its full share of the load.

Gears mesh smoothly, wear longer, with shafts on TIMKEN® bearings

Here is a typical gear-case countershaft showing a common method of mounting Timken bearings. Due to the line contact between the rolls and races, Timken bearings give the shaft maximum support. There's less chance of deflection under load. The tapered bearing design takes both radial and thrust loads in any combination. End-movement of the shaft is kept to a minimum. Gears wear longer—work better.





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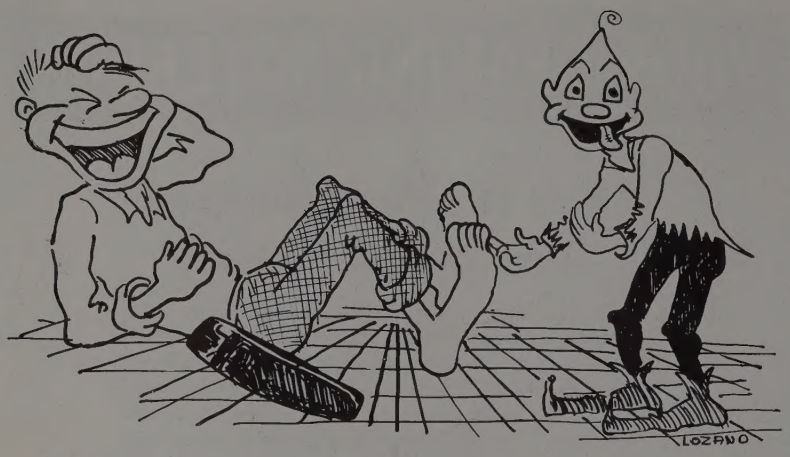

TECHNOCRACKS

Edited by George Ratz, C.E. '52

Professor: "Here you see the skull of a chimpanzee, a very rare specimen. There are only two in the country—one in the national museum, and I have the other."

* * *

She: "Is it true that I'm the first model you ever kissed?"

Artist: "Yes."

She: "How many models have you had before me?"

Artist: "Four. An apple, two oranges, and a basket of flowers."

* * *

Anyone can play bridge, but it takes a cannibal to throw up a hand.

* * *

JOKE NO. 140-327

We can't tell it here. So write for it!

* * *

"Grandma, get out of that stable. You're much too old to be horsing around."

* * *

Gamma Phi: "Where is Betty?"

Housemother: "I don't know; she went to the library."

* * *

Confuscious say: "If at first you don't succeed, try a little ardor."

* * *

A poultry expert was asked by a little old lady to examine her chicken flock. In with her White Rock hens was a New Hampshire Red cock.

"But my dear lady," he exclaimed aghast, "if you want to keep those White Rocks pure, you must get that Red rooster out of here."

"Oh," she replied, "it's all right. I remove him every night."

* * *

"Did you miss your train, sir?"

"No, I didn't like its looks, so I chased it out of the station."

1950 bathing suit: Two bandannas and a worried look.

* * *

PROBLEM OF THE MONTH

A cross-eyed woodpecker with a cork leg and a synthetic rubber bill requires 4½ hours to peck ¾ of the distance through a cypress log 53 years old. Shingles cost 79 cents per hundred and weigh 8 ounces apiece. The log being pecked upon is 34 feet long and weighs 46 pounds per foot. Assuming that the coefficient of friction between the woodpecker's bill and the cypress log is 0.097 and that there is negligible resistance to diffusion, how many units of vitamin B_1 will the woodpecker require in pecking out enough shingles for a $7,500 barn with detachable chicken house? The woodpecker has an efficiency of 97 per cent and gets time and a half for overtime.

* * *

An English soldier in a French village seeing a wedding in process at a church asked a Frenchman whose wedding it was.

"Je ne sais pas, M'sieu," answered the Frenchman.

A few hours later the same soldier saw a coffin going into the same church and curiosity getting the better of him, he again asked the identity of the individual.

"Je ne sais pas," was the response.

"Blimey!" ejaculated the Tommy, "he didn't last long!"

* * *

A man boarded a pullman and gave the porter $5 to wake him up when the train reached Podunk at 4 a. m. "Now, porter, I'm a very heavy sleeper, so you may have to drag me out of the berth, put my clothes on me, and carry me out to the platform. And no matter how much I resist, don't pay any attention."

Next morning the man awoke to find himself in New York. Boiling mad, he sought out the porter and roundly cussed him out.

The porter shook his head in admiration. "Boss, you sho' has got a temper, but it ain't nothin' to compare to the gent'man's that I put off the train this mornin' at Podunk."

* * *

The lunatic who, after a very exemplary record of sanity, was discharged from the asylum, was returned home, and on the following morning decided to shave as every sane man does. He nailed the mirror to the wall, stood before it, lathered his face, then, selecting an old-fashioned razor, proceeded to shave; at this moment the nail slipped and the mirror fell to the floor. He stood gazing at the blank wall before him, then remarked bitterly: "Just my luck, second day out, and I've cut my blooming head off."

* * *

Three small boys were sitting on the curb.

One was playing with an airplane.

One was playing with a fire engine.

One was reading *Esquire*.

A kindly old man approached and asked them what they wanted to be when they grew up.

The first replied that he wanted to pilot a B-29.

The second wanted to be a fireman.

The third, looking up from his magazine, replied, "Aw, it isn't important; I just want to grow up."

* * *

"What kind of toothpaste do you use?"

"None. My teeth ain't loose."

* * *

"Patrolman Cassidy calling," came a voice from the hall, accompanied by a loud knocking on the door of apartment 4-A.

"What do you want?" a woman demanded from within. Her voice did not suggest rippling waters.

"It's your husband," hollered the cop. "A big steam roller just ran over him."

"Well, don't stand there talking," commanded the wife. "Slide him in under the door."

* * *

God made a machine, the machine made men;
Doctors, lawyers, priests and then
The devil got in and stripped the gears
And turned out the first batch of engineers.

* * *

Bill Johnson has two sons. One is a Journ student and the other isn't much good either.

* * *

If nobody quit high school who would there be to hire college graduates?